Department of Energy

ROCKY FLATS FIELD OFFICE APR -9 P 1: 54

10808 HIGHWAY 93, UNIT A
GOLDEN, COLORADO 80403-8200 RRESPONDENCE

CONTROL

APR 0 4 2002

02-DOE-00527

DUE DATE ACTION

DIST.

GENBERGER, V

GNAR, E

DEGENHART. K

DIETERLE, S. F FERRERA, D.W. FERRI, M.S.

GERMAIN, A. GIACOMINI, J

CLAUGHLIN.

RAAZ R D

COTT, G.K

Gibbs F.

MYGRS, K

BROOKS

MARSCHALL

Mr. Steven H. Gunderson
Rocky Flats Cleanup Agreement Coordinator
Colorado Department of Public Health and Environment
4300 Cherry Creek Drive South
Denver, CO 80246-1530

Dear Mr. Gunderson:

Please find enclosed a completed Rocky Flats Cleanup Agreement Standard Operating Protocol (RSOP) for Facility Disposition notification form for Building 886 explosive demolition.

In accordance with the Facility Disposition RSOP, this letter and it's enclosure are notification for RSOP implementation. This notification is for all activities required to structurally weaken the thick concrete walls and ceiling of Room 101 in Building 886 using explosives making mechanical demolition of the structure more economic and safe.

The process planned for use on the four and five-foot thick concrete walls and two-foot thick concrete ceiling will undergo explosive harmonic delamination. Harmonic delamination is a process employed by Controlled Demolitions Incorporated (CDI), a world class explosive demolition firm, whereby closely timed small explosion are used to vibrate a structure such that the cohesion of the portland cement matrix and the reinforcing steel and aggregate is loosened making mechanical demolition much easier. The structure will probably remain standing after delamination.

Please find enclosed in addition to the notification form, a schedule, and an evaluation of demolition methods that provide greater detail.

The stakeholders have been notified in both the December and March Environmental Restoration and Decontamination and Decommissioning meetings of the planned use of explosives, and a workshop going over the evaluation of demolition methods was held with the stakeholders in January. No adverse comments were received.

In that the planned shot is scheduled for April 12, 2002, expedited review and comment is requested. Questions can be directed to Steve Tower at (303) 966-2133.

COR CONTROL X X
ADMN RECORD X X
PATS/130

Reviewed for Addressee Corres, Control RFP

4/9/02 leg Date By f

Ref. Ltr. #

DOE ORDER#

Enclosures



Joseph A. Legare Assistant Manager

Sincerely.

for Environment and Stewardship

ADMIN RECORD

1/20

B886-A-000057

cc w/o Encs:

S. Tower, AMP, RFFO

F. Gibbs, K-H

J. Marschall, K-H

K. Myers, K-H

T. Rehder, EPA

cc w/Encs:

T130G Administrative Record

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RSOP for Facility Disposition Checklist

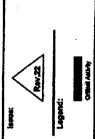
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Administrative Record Requirements for this Activity

- Final Rocky Flats Cleanup Agreement (RFCA)
- RFETS Decommissioning Program Plan (DPP)
- RFCA Standard Operating Protocol for Facility Disposition
- Reconnaissance Level Characterization Report for the 886 Cluster Decommissioning Project
- Building 886 Interim Measure/ Interim Remedial Action Plan
- Notification Letter and attachments and subsequent CDPHE correspondence, if appropriate

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K-H Construction B886 Demolition Schedule 3 Critical Activity Progress Bar Early Bar



Sheet 1 cf 4



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Start Date

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Sheet 2 of 4

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EVALUATION DEMOLITION METHODS

for

Building 886

RISS CLOSURE PROJECT

February 2002

1. Introduction

This evaluation appraises the potential methods for the demolition of Building 886 (Room 101) at the Rocky Flats Environmental Technology Site (RFETS). The approaches to the Room 101 demolition were evaluated based on proposals from demolition subcontractors. The demolition subcontractors were asked to evaluate Room 101 and propose the safest and most efficient means for demolishing that portion of the facility. The methods evaluated include mechanical demolition to include excavators with attachments, implosion of the structure and a combination of explosives called harmonic delamination and mechanical means.

Harmonic delamination is the combination of small amounts of high-velocity explosive charges with millisecond delays in the initiation sequence to allow for the fracturing/delamination of concrete without major displacement of debris particles or generation of excessive overpressure or vibration. Detonation waves created by small, high velocity explosive charges dissipate in the direction of least resistance. When those waves pass through an object, the waves seek superficial face via the densest component of the mass. In passage, the detonation waves cause materials of differential density (such as, aggregate or reinforcing bar) to oscillate at differential velocity compared to the cement mix surrounding those components. The differential oscillation of those components causes delamination of both aggregate and rebar from the mass, disrupting the structural force system created by the combination of concrete and rebar.

The mechanical means of demolition recommended by demolition subject matter experts for Room 101 was excavator with attachments. The wrecking ball method of demolition was not evaluated because the method is difficult to control from a health and safety and dust perspective. Cabling was not evaluated because this method would not work on a structure of this size and construction. Non-explosive cracking agent was not evaluated because it is generally used on horizontal surfaces and small areas. Diamond wire cutting was not evaluated because it is too costly and time consuming.

2. Evaluation Scope

The evaluation only includes demolition activities for Room 101 and the associated hallway into Room 101 of Building 886. Activities before and after demolition are the same regardless of the demolition method. Before initiating demolition activities, the subject areas will be prepared in the following manner:

- The walls will be decontaminated
- The pre-demolition survey will be completed
- The walls will be draped in plastic to minimize the potential for cross contamination
- The slab in Room 101 will be removed through saw cutting
- The soil beneath the slab in Room 101 will be characterized and remediated, if necessary
- Confirmatory surveys will be performed on the walls to ensure that the concrete still
 meets the unrestricted release criteria
- The below grade opening will be plugged, capped, blind flanged or covered with protective covering, as appropriate
- The Pre-Demolition Survey Report will be approved by DOE and LRA
- The Demolition Plan will be completed

The purpose of the evaluation is to determine which of the methods are viable for demolition of the Room 101. The evaluations developed by the individual subject matter experts are subjective and based on their years of experience. While many methods were considered, only a few were evaluated completely. For example, use of a wrecking ball was considered but not evaluated based on the inherent safety concerns, increased fugitive emissions, and increased amount of runoff generation due to dust suppression efforts. The methods evaluated are viable means for demolition of the structure, but certain aspects of each method may be preferable over the other methods. For example, complete implosion of Room 101 will be the fastest means of demolishing the structure and would have the least exposure to the workers for industrial hazards, but it would create more dust in a shorter period of time than mechanical means or by weakening the structure with explosives prior to mechanical demolition. This evaluation will not determine the demolition method for the subject structure, but the evaluation will be used by the decision-makers to understand all of the benefits or ramifications prior to making a decision.

2.1. **Building 886**

The continued presence of large quantities of fissile material in numerous forms at the Rocky Flats Plant made it necessary to maintain an active criticality safety program. A Nuclear Safety Group was formed in 1953 to perform the criticality experiments. Once Building 886 was commissioned, the Nuclear Safety Group conducted its work there. Since that time, the Nuclear Safety Group conducted about 1,700 critical mass experiments using uranium and plutonium in solutions, compacted powder, and metallic forms. Building 886 housed the Critical Mass Laboratory, and was operated from 1965 until 1987.

Building 886 is rectangular structure with a shallow-pitched gabled roof. Two shed-roof wings extend from its northeast and southeast corners. A 37-foot tall concrete windowless building (Room 101) is attached to the south. A temporary pre-fabricated trailer housing offices is attached to the northeast wing by a breezeway. Building 886 is 10,360 square feet on a single level.

Building 886 consists of three areas: the Radiological Area; office space; and a small electronics and machine shop. The Radiological Area is comprised of three rooms and a hallway. Almost all criticality experiments were conducted in Room 101, the assembly room. The walls are reinforced concrete, greater than or equal to 4 feet thick and the ceiling is 2 feet thick. Room 102, a storage vault, was constructed in the mid-1970s to meet the Department of Energy requirements for a Special Nuclear Material Vault. Both rooms, 101 and 102, have double reinforced concrete walls integrally cast to the ceiling. Room 103, the Mixing Room, was a fissile solution storage area; three walls are reinforced concrete, and the west wall is cinder blocks. The remainder of the load bearing walls in Building 886 are constructed of cinder blocks. The exterior wall of Room 102 is also lined with cinder block.

Currently, Kaiser-Hill Construction is conducting the Building 886 decommissioning. The general sequence of activities for the Building 886 Project decommissioning is:

- Isolate power to Building 886
- Install temporary power
- Strip-out office areas and radiological areas inside Building 886

- Flush, isolate, cap traps and sanitary sewer lines
- Abate asbestos
- Decontaminate structure
- Partially remove HVAC system
- Perform pre-demolition survey
- Place plastic on the walls around Room 101 and around the sump in Room 103
- Remove slab in Room 101 and sump in Room 103
- Complete ventilation removal
- Characterization and remediate soil, as necessary
- Perform confirmatory surveys
- Plug the tunnel opening
- Demolish structure
- Remove tunnel to three feet below grade and backfill

The floor in Room 101, contains trenches for electrical conduit that were filled with concrete and are expected to contain contamination. The trenches will be removed along with the section of floor that encapsulates the ventilation exhaust duct feed for Room 101. Previous coring inside Room 101 reveals a variation in depth from 8 inches on the south side of Room 101 to 20 inches on the northwest. On the south side of Room 103, a pit area exists that housed storage tanks during facility operation (tanks were previously removed). Previous coring of the Room 103 Pit Area reveals the floor slab to be 8 inches in depth and the cores contained volumetric contamination.

Before removing the slab, Rooms 101 and 103 will be decontaminated and the pre-demolition surveys will be performed. The walls will be covered with flame retardant plastic to minimize the potential for cross contamination. Verification surveys will be conducted after the slab removal and soil characterization and remediation are complete to ensure that the walls have not been contaminated during the activity.

The contaminated concrete floors will be removed utilizing mechanical methods (i.e., jackhammers, pulverizing equipment) or an approved concrete cutting Subcontractor. Additional sampling performed in Room 102 indicates a limited amount of surface contamination. Therefore, the floor in Room 102 will be hydrolased to remove any surface contamination, as well as removing the paint for direct access to the floors to meet the requirements of the Pre-Demolition Surveying Checklists.

This evaluation specifically addresses the demolition of the walls around Room 101 and the hallway into Room 101. The load bearing walls are 4 feet thick, with the exception of a portion of the immediate hallway to Room 101, which is 5 feet thick. All walls are double reinforced with steel/re-bar. The ceilings are 2 feet thick and double reinforced.

In accordance with the Integrated Monitoring Plan, the Industrial Area RAAMP monitors will switch to a weekly filter collection a week before the Building 886 demolition is initiated and continue until a week after the demolition is complete. A hypothetical release of 1 curie U-234



was modeled with CAP88-PC using the meteorological data from 2001 that indicated that Sampler 119 was the most impacted and Sampler 212 was the second most impacted. Sampler 119 is approximately 343 meters east of Building 886, and Sampler 212 is approximately 623 meters east-southeast of Building 886.

3. Evaluation Summary

Table 1 contains the demolition method evaluation for the Room 101 in Building 886 with explosives versus mechanical means. The following sections summarize the results of the evaluation of demolition techniques for Room 101. In addition, each section indicates the preferred method for demolition with respect to the criteria. The decision on what demolition method will be used for the Room 101 in Building 886 will not be made by this evaluation, but the evaluation will be used by the decision-makers.

3.1. Health and Safety Evaluation

A certified safety professional developed the activities, hazards, and controls associated with each method of demolition, and using that information, determined the positive and negative aspects of each method from a health and safety perspective. The demolition methods were evaluated assuming the hazards were not mitigated using a risk assessment code methodology. From a health and safety perspective, all of the hazards can be controlled thereby reducing the risk, which is why the methods are evaluated without the controls. Assuming the appropriate controls are in place, all demolition methods are essentially equivalent from a worker health and safety perspective. Both demolition methods using explosives have a shorter duration, statistically lowering the potential for incidents, which is why those methods are slightly more preferred.

3.2. Environmental

An environmental subject matter expert outlined the potential impacts associated with each method of demolition, and using that information, determined the positive and negative aspects of each method from an environmental perspective. In general, the demolition methods involving explosives had more positive/acceptable impacts than the straight mechanical demolition. The categories that differentiated the methods were soils and geology, air quality, water quality, human health and safety, and noise. The primary reason the methods involving explosives had more positive/acceptable impacts was primarily due to the decreased duration of project activities. None of the methods have significant environmental impacts.

3.3. Structural

An engineer evaluated the effectiveness of each method of demolition, and using that information, determined the positive and negative aspects of the effectiveness of the each method. The structural evaluation indicates that all of the demolition methods evaluated are viable demolition techniques. The combined explosive and mechanical method evaluated slightly better than the other two methods because dropping the structure to the ground and then mechanically busting up the larger rebar-free sectional pieces with much more direct access than the straight mechanical method, also allows for more absolute dust control via a hose stream than the implosion method. Overall, harmonic delamination and the excavator demolition method is the most efficient, is inherently safer, and has the best opportunity for dust control.

3.4. Economic

The economic evaluation was based on fixed priced estimates provided by the subcontractors. The cost and duration for mechanical demolition are presented as ranges because walls of this thickness have not been demolished at Rocky Flats. The low end of the range represents the cost if everything goes perfectly, and the high end of the range represents a worse case scenario. An average was used to evaluate this cost against the other proposed methods. Costs associated with removing the material after demolition were not included due to those costs being required and necessary regardless of method used. The economic evaluation indicates that mechanical demolition is the most cost-effective method, although the range of the costs is insignificant.

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1 Evaluation ¹
Demolition
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Project The project area will be set up with at least a The project area will be set up with at least a The project area will be set up with at least a month of a 100-foot radius around the building. Only a 100-foot radius around the building will be taken to the properties and the careavators will have a hoc ann to break span to break span the building will be fully a projective will be the thick will be the proportinately 33 holes will be fully be projected by the projective will be the proportinately a prop				
The project area will be set up with at least a the project area will be set up with at least a the bed and the building. Only authorized personnel will be allowed in this area. Two 345 excavators will be use to systematically approximately 53 holes will be use to systematically approximately 53 holes will be use to systematically approximately 53 holes will be defined and demolish the structure. One of the placed in each hole. The affected part of the thick walls and the often excavator will be building will be wrapped in 2 layers of manage the pieces. In addition to the two places for mimize flying projectile, approximately that control. During demolition activities, engineering courted and two laborers operating outsol to prevent dust levels from exceeding the course will be used as a engineering courted and used the levels from exceeding the demolition debris with water while the demolition is three to four weeks. The duration of the demolition is three to supprove and the actual demolition four the demolition is three to could be completed in 2 days.		Mechanical Demolition	Explosive Implosion	Harmonic Delamination and Mechanical
authorized personnel will be allowed in this area. Two 345 excavators with process/shear demolish the structure. One of the approximately 53 holes will be drilled and demolish the structure. One of the approximately 12 pounds of explosive will excavators will have a hoe error and to break apart the thick walls and the other excavator will be building will be wrapped in 2 layers of manage the pieces. In addition to the two placed in each hole. The affected part of the thick walls and the other excavator will be building will be wrapped in 2 layers of manage the pieces. In addition to the two 9-gauge wire fabric intertwined with 2 equipment operators, a sporter will be layered and two laborers operating hoses for minimize flying projectiles, approximately 600 las of explosives (NONEL) would be used. During demolition activities, engineering control to prevent dust levels from exceeding the OSHA PEL Laborers will spray the demolition activities are being performed. The duration of the demolition is three to four the drilling could be completed in 11 days during the layer and the area of the demolition activities are being performed. The drilling could be completed in 1 days during the lag time for the pre-demolition could be completed in 2 days.	Project Description ²	The project area will be set up with at least a 100-foot radius around the building. Only	├	The project area will be set up with at least a
area. In order to implode room 101, approximately 53 holes will be drilled and approximately 12 pounds of explosive will be placed in each hole. The affected part of the building will be wrapped in 2 layers of 9-gauge wire fabric intertwined with 2 layers of 12-ounce geotextile fabric to minimize flying projectiles, approximately 600 lbs of explosives (NONEL) would be used. Dust control measures would be utilized during drilling activities with a filter system on the drill. The streets around the area would be swept after the post-implosion. The drilling could be completed in 11 days during the lag time for the pre-demolition survey approval and the actual demolition could be completed in 2 days.	moratives.	authorized personnel will be allowed in this	authorized personnel will be allowed in this	authorized nerconnel urill he allowed in this
In order to implode room 101, approximately 53 holes will be drilled and approximately 12 pounds of explosive will be placed in each hole. The affected part of the building will be wrapped in 2 layers of 9-gauge wire fabric intertwined with 2 layers of 12-ounce geotextile fabric to minimize flying projectiles, approximately 600 lbs of explosives (NONEL) would be used. Dust control measures would be utilized during drilling activities with a filter system on the drill. The streets around the area would be swept after the post-implosion. The drilling could be completed in 11 days during the lag time for the pre-demolition survey approval and the actual demolition could be completed in 2 days.		area.	area.	area.
approximately 53 holes will be drilled and approximately 12 pounds of explosive will be placed in each hole. The affected part of the building will be wrapped in 2 layers of 9-gauge wire fabric intertwined with 2 layers of 12-ounce geotextile fabric to minimize flying projectiles, approximately 600 lbs of explosives (NONEL) would be used. Dust control measures would be utilized during drilling activities with a filter system on the drill. The streets around the area would be swept after the post-implosion. The drilling could be completed in 11 days during the lag time for the pre-demolition survey approval and the actual demolition could be completed in 2 days.		Two 345 excavators with process/shear	In order to implode room	Harmonic delamination of Room 101 and
approximately 12 pounds of explosive will be placed in each hole. The affected part of the building will be wrapped in 2 layers of 9-gauge wire fabric intertwined with 2 layers of 12-ounce geotextile fabric to minimize flying projectiles, approximately 600 lbs of explosives (NONEL) would be used. Dust control measures would be utilized during drilling activities with a filter system on the drill. The streets around the area would be swept after the post-implosion. The drilling could be completed in 11 days during the lag time for the pre-demolition survey approval and the actual demolition could be completed in 2 days.		attachments will be use to systematically	approximately 53 holes will be drilled and	removal of the roof will consist of drilling
the building will be wrapped in 2 layers of 9-gauge wire fabric intertwined with 2 layers of 12-ounce geotextile fabric to minimize flying projectiles, approximately 600 lbs of explosives (NONEL) would be used. Dust control measures would be utilized during drilling activities with a filter system on the drill. The streets around the area would be swept after the post-implosion. The drilling could be completed in 11 days during the lag time for the pre-demolition survey approval and the actual demolition could be completed in 2 days.		excavators will have a hoe ram to break ement	approximately 12 pounds of explosive will be nigged in each hole. The effected and of	vertical holes, approximately 3.5-4 lineal feet
9-gauge wire fabric intertwined with 2 layers of 12-ounce geotextile fabric to minimize flying projectiles, approximately 600 lbs of explosives (NONEL) would be used. Dust control measures would be utilized during drilling activities with a filter system on the drill. The streets around the area would be swept after the post-implosion. The drilling could be completed in 11 days during the lag time for the pre-demolition survey approval and the actual demolition could be completed in 2 days.		the thick walls and the other excavator will	the building will be wrapped in 2 lavers of	or each cubic yard of concrete, and loading explosives in those holes. The roof will he
layers of 12-ounce geotextile fabric to minimize flying projectiles, approximately 600 lbs of explosives (NONEL) would be used. Dust control measures would be utilized during drilling activities with a filter system on the drill. The streets around the area would be swept after the post-implosion. The drilling could be completed in 11 days during the lag time for the pre-demolition survey approval and the actual demolition could be completed in 2 days.		manage the pieces. In addition to the two	-	removed with explosives before blasting the
minimize flying projectiles, approximately 600 lbs of explosives (NONEL) would be used. Dust control measures would be utilized during drilling activities with a filter system on the drill. The streets around the area would be swept after the post-implosion. The drilling could be completed in 11 days during the lag time for the pre-demolition survey approval and the actual demolition could be completed in 2 days.		equipment operators, a spotter will be		walls; it will be removed in quarters. Once the
used. Dust control measures would be utilized during drilling activities with a filter system on the drill. The streets around the area would be swept after the post-implosion. The drilling could be completed in 11 days during the lag time for the pre-demolition survey approval and the actual demolition could be completed in 2 days.		dust control		holes are drilled in the walls, exterior surfaces
Dust control measures would be utilized during drilling activities with a filter system on the drill. The streets around the area would be swept after the post-implosion. The drilling could be completed in 11 days during the lag time for the pre-demolition survey approval and the actual demolition could be completed in 2 days. A Durapulse dust collector and palletizing system will be used during doperations - a study indicates it cuts emity by 92%. During blasting, the geotextile placed of walls will be wet and water will be placed the roof to control dust. The drilling could be completed in 2 days. During blasting, the geotextile placed of walls will be wet and water will be placed of during the lag time for the pre-demolition survey approval, the harmonic delamic could be completed in 1 day, and demolition with an excavator could demolition and accounts of the pre-demolition could be completed in 1 day, and demolition with an excavator could demolition and palletized or the pre-demolition with an excavator could demolition could be completed in 1 day, and demolition could demolition could demolition could be completed in 1 day, and demolition could demolition c		The state of the s	ow to ot explosives (NUNEL) Would be	will be covered with one or more layers of
during drilling activities with a filter system on the drill. The streets around the area would be swept after the post-implosion. The drilling could be completed in 11 days during the lag time for the pre-demolition could be completed in 2 days. A test shot will be required to determination operations. A test shot will be required to determination operations and the actual demolition required. A Durapulse dust collector and palletizing system will be used during doperations - a study indicates it cuts emity by 92%. During blasting, the geotextile placed of walls will be wet and water will be placed the roof to control dust. The drilling could be completed in 1 days, and demolition with an excavator could be completed in 1 day, and demolition with an excavator could demolition was supproved.		During demosition activities, engineering	Dent condent messes and the second se	chain link rence fabric and geotextile fabric.
and the drill. The streets around the area would be swept after the post-implosion. The drilling could be completed in 11 days during the lag time for the pre-demolition could be completed in 2 days. A Durapulse will be required. It is antic that less than 500 pounds of Exgel we required. A Durapulse dust collector and palletizing system will be used during doperations - a study indicates it cuts emily 992%. During blasting, the geotextile placed of walls will be wet and water will be placed the roof to control dust. The drilling could be completed in 1 day, and demolition with an excavator could be completed in 1 day, and demolition with an excavator could be completed in 1 day, and demolition with an excavator could be completed in 1 day, and demolition with an excavator could be completed in 1 day, and demolition with an excavator could be completed in 1 day, and demolition with an excavator could be completed in 1 day, and demolition with an excavator could be completed in 1 day, and demolition with an excavator could be completed in 1 day, and demolition with an excavator could be completed in 1 day, and demolition with an excavator could be completed in 1 day, and demolition with an excavator could be completed in 1 day.		controls will be implemented to limit dust.	Just control measures would be utilized	The fracturing of the walls will be conducted in
would be swept after the post-implosion. The drilling could be completed in 11 days during the lag time for the pre-demolition survey approval and the actual demolition could be completed in 2 days. A test shot will be required to determine that less than 500 pounds of Exgel we required. A Durapulse dust collector and palletizing system will be used during doperations - a study indicates it cuts emily 92%. During blasting, the geotextile placed of walls will be wet and water will be placed the roof to control dust. The drilling could be completed in 11 day, and demolition with an excavator could demolition with an excavator could during the lag time for the pre-demolition with an excavator could demolition demolities and definite and whether with definite and demolities are successed and definite and determined to determine and demolities and demolities are demolities and definite and definite and definite and definite and demolities are demolities and definite an		water was select as an engineering control to prevent dust levels from exceeding the	on the drill. The streets around the area	no less than 4 and no more than 10 production delamination overstions
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during the lag time for the pre-demolition required. could be completed in 2 days. A Durapulse dust collector and palletizing system will be used during doperations - a study indicates it cuts emily 92%. During blasting, the geotextile placed of walls will be wet and water will be place the roof to control dust. The drilling could be completed in 11 during the lag time for the pre-demolected in 1 during the lag time for the pre-demolected in 1 day, and demolition with an excavator could demolition with an excavator could		water while		amount of explosives required. It is anticipated
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could be completed in 2 days. A Durapulse dust collector and palletizing system will be used during d operations - a study indicates it cuts emi by 92%. During blasting, the geotextile placed walls will be wet and water will be place the roof to control dust. The drilling could be completed in 11 during the lag time for the pre-demo survey approval, the harmonic delamic could be completed in 1 day, and demolition with an excavator could constituted in 1 day, and demolition with an excavator could constituted in 1 day.		The duration of the demolition is three to	survey approval and the actual demolition	required.
		four weeks.	could be completed in 2 days.	A Durapulse dust collector and water
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During blasting, the geotextile placed on the walls will be wet and water will be placed on the roof to control dust. The drilling could be completed in 11 days during the lag time for the pre-demolition survey approval, the harmonic delamination could be completed in 1 day, and actual demolition with an excavator could be		-		operations - a study indicates it cuts emissions by 92%
walls will be wet and water will be placed on the roof to control dust. The drilling could be completed in 11 days during the lag time for the pre-demolition survey approval, the harmonic delamination could be completed in 1 day, and actual demolition with an excavator could be				During blasting, the geotextile placed on the
The drilling could be completed in 11 days during the lag time for the pre-demolition survey approval, the harmonic delamination could be completed in 1 day, and actual demolition with an excavator could be				walls will be wet and water will be placed on
The drilling could be completed in 11 days during the lag time for the pre-demolition survey approval, the harmonic delamination could be completed in 1 day, and actual demolition with an excavator could be				the roof to control dust.
during the lag time for the pre-demolition survey approval, the harmonic delamination could be completed in I day, and actual demolition with an excavator could be				The drilling could be completed in 11 days
survey approval, the harmonic delamination could be completed in I day, and actual demolition with an excavator could be				during the lag time for the pre-demolition
could be completed in I day, and actual demolition with an excavator could be				survey approval, the harmonic delamination
excavator				could be completed in I day, and actual
				excavator

¹ Each area evaluated, has a narrative row followed by an evaluation of the criteria: + is a positive aspect, 0 is a neutral aspect, and -- is a negative impact, indicating the ranking of hazards, impacts, or acceptability

² The project descriptions are based on proposed demolition processes; the actual processes may differ slightly and will be documented in the Demolition Plan

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	Mechanical Demolition	Explosive Implosion	Harmonic Delamination and Mechanical Demolition
Health and Safety	Qualitative assessment of this demolition method is considered to have an average	Qualitative assessment of this demolition method is considered to have an average	Qualitative assessment of this demolition method is considered to have an average
	oversul medium/nigh nak to Site workers, personnel, equipment, and property if hazards	overall medium/high risk to Site workers, personnel coupment and property if	overall medium/high risk to Site workers,
	are not properly mitigated. However, when	hazards are not properly mitigated. However,	personner, equipment, and property in nazards are not properly mitigated. However, when
	proper engineering, administrative, and Personal Protective Emigracest (DPE) controls	when proper engineering, administrative, and	proper engineering, administrative, and PPE
	are implemented, the average overall risk is	overall risk is considered to be low. Major	controls are implemented, the average overall risk is considered to be low. Major potential
	considered to be low. Major potential	potential hazards/sources identified for the	hazards/sources identified for the major
	hazards/sources identified for the major	major operations include the following:	operations include the following:
	operations include the following:	• Fall from elevation (roof)	Harmonic Delamination
	Country Westernities	Contact w/electrical (drill)	 Fall from elevation (roof)
	• Struck by moving venicles	Contact w/ sharp objects (drill bit)	Contact w/electrical (drill)
	- Caught between pinch points	Struck by debris (concrete)	Contact w/ sharp objects (drill bit)
	Contact with attach objects	 Falling debris below (concrete) 	 Struck by debris (concrete)
	Charlesulic fluid	Exposure to dust (drill, explosion)	 Falling debris below (concrete)
	Overexection from material bandling	Exposure to noise (drill, explosion)	 Exposure to dust (drill, explosion)
	Strick by (dehris re-har)	Overexertion from material handling	 Exposure to noise (drill, explosion)
	• Exposure to dust (concrete)	(equipment)	 Overexertion from material handling
	• Exposure to noise (breaker)	Unplanned detonation (explosives)	(equipment)
	Equipment accident (heavy equipment)	Unplanned structural collapse (walls)	 Unplanned detonation (explosives)
	(manufacture)	 Pall on same level (debris, re-bar) 	 Unplanned structural collapse (walls)
			 Fall on same level (debris, re-bar)

³ Each area evaluated, has a narrative row followed by an evaluation of the criteria: + is a positive aspect, 0 is a neutral aspect, and - is a negative impact, indicating the ranking of hazards, impacts, or acceptability

4 Reference H&S Risk Assessment - 886 Demolition 1/31/02

Table 1. Demolition Evaluation⁵

	Mechanical Demolition	Explosive Implosion	Harmonic Delamination and
Health and Safety	Major controls include the following: Work control document Job Hazard Analysis Pre-evolution Briefings & Awareness Use of trained and qualified personnel De-energizing electrical power Establish exclusion zones High visibility vests PPE Dust suppression	Major controls include the following: Work control document Job Hazard Analysis Pre-evolution Briefings & Awareness Use of trained and qualified personnel De-energizing electrical power Establish exchasion zones High visibility vests PPE Dust suppression	Mechanical Demolition Contact w/electrical (O/H power lines) Struck by moving vehicles (heavy equipment) Caught between/pinch points (attachment and boom) Contact with petroleum product (hydraulic fluid) Overexertion from material handling (equipment) Struck by (debris, re-bar) Exposure to dust (concrete) Exposure to noise (breaker) Exposure to noise (breaker) Exposure accident (heavy equipment) Major controls include the following: Work control document Job Hazard Analysis Pre-evolution Briefings & Awareness Use of trained and qualified personnel De-energizing electrical power Establish exclusion zones High visibility vests
Overall Risk to Site Workers, personnel, equipment, and property	0,	80 +	• Dust suppression +8

5 Each area evaluated, has a narrative row followed by an evaluation of the criteria: + is a positive aspect, 0 is a neutral aspect, and - is a negative impact, indicating the ranking of hazards, impacts, or acceptability

Reference H&S Risk Assessment - 886 Demolition 1/31/02

Overall, the use of an "Excavator with Attachments" may take a longer period time and require some workers to be in closer proximity to the demolition. Because of this and the fact that method's average overall mitigated risk rating was low, this method was given a neutral (0) aspect rating.

ships that use of this method would save approximately 3-4 weeks off the project schedule and, in turn, further mitigates potential risk exposures to Site workers, personnel, equipment, and property. Based on this, this method was given a positive (+) aspect rating.



Table 1. Demolition Evaluation'

ł.		HAN ALL WINDOWS ATTEMPTON	
	Mechanical Demolition	Explosive Implosion	Harmonic Delamination and
			Mechanical Demolition
Environmental	This method has medium environmental	This method has minimal environmental	This method has medium environmental
	impacts:	impacts.	ğ
	Impacts to air quality: an operator wetting	 Impacts to air quality: fugitive dust will be 	uality: fugit
	the structure with a fire hose will control	controlled by a litter system during drilling	EK EK EK
	fugitive dust. This will result in more dust	r sweeper	containment during
	generation ouring the lengthy demonition	demonition. Venicle and equipment emissions are less with this method due to	Addition to weather rejects detenation
•	s will be higher with t	the one-day duration.	• Immacts to air mislity: an operator
	due to the duration.	· Impacts to surface water quality may	wetting the structure with a fire hose
	 Impacts to surface water quality may 	occur, such as runoff generated during and	during mechanical demolition will
	occur, such as ranoff generated during	after dust control.	control fugitive dust. This will result in
	and after dust control.	to soils are expe	generation during the
	Some impacts to soils are expected from	structure. No	process. venic
	dust control, the falling structure and vehicular traffic. No soil contamination	contamination or crosion impacts are expected, as the facility will meet the	equipment emissions are a potential issue.
			Impacts to water quality may occur, such
	unrestricted release criteria prior to		as munoff generated during and after duet
		 No impacts to wildlife are expected since 	control.
	 No impacts to wildlife are expected. 	the building is in the industrial area.	Minimal impacts to soils are expected
•	Efforts will be taken to cordon off the	However, efforts will be taken to cordon	from dust control, the falling structure
· · · · · · · ·	area to wildlife.	off the area to personnel and wildlife.	and vehicular traffic. No soil
	may generate ac	 This method will generate little additional 	contamination is expected, as the facility
	·	waste (chain link or geotextile containment	will meet the unrestricted release criteria
	demolition due to the duration. It is	only) when compared to the mechanical	prior to demolition.
	expected to take three to four weeks.	methods.	No impacts to wildlife are expected
	 Resource use is increased by this method 	 Resource use is minimized by this method, 	Efforts will be taken to cordon off the
	due to the demolition duration.	as the demolition duration is limited to one	area to wildlife.
		day.	Resource use is decreased by this
			method as the demolition duration is
_			expected to be approximately one and half weeks.
Soils and Geology		+	0
Air Quality	1	0	+
Water Quality	6	0	+
Human Health and Safety	у	4	0
Ecological Resources	0	0	0
Historical Resources		0	U
Visual Resources	0	U	U
7	>		
Noise	1	***	0

9 Each area evaluated, has a narrative row followed by an evaluation of the criteria: + is a positive aspect, 0 is a neutral aspect, and - is a negative impact, indicating the ranking of hazards, impacts, or acceptability



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		ALL ACTION OF TAXABLE OF	
	Mechanical Demolition	Explosive Implosion	Harmonic Delamination and
Structural	This method is technically feasible. Of the three methods evaluated, this is the most labor intensive and purely mechanical machinery brute force. The floor will be removed prior to ceiling and walls, which will act as confinement for the contaminated floor removal. A typical method used for a six sided above grade concrete structure is to destroy one wall at a time until the ceiling collapses. However, this structure is not typical. It is two stories tall with extraordinarily thick walls. These 4 - 5 foot thick reinforced concrete walls will be difficult and time consuming for an excavator mounted ram to break apart and impractical for a shear to be useful other than rebar trimming for chunk separation. A shear attachment is often used on floor or ceilings, but in this case the ceiling thickness and height render this attachment useless, except for the rebar. Therefore, this method requires that nearly 100% of the demolition of the Room 101 structure be performed by an excavator mounted ram. Recent experience with thick concrete slab removal at PACS 1 took approximately 2 weeks to destroy with the advantage of being under the excavator vs. the vertical walls. The falling ceiling poses a distinct safety disadvantage when comparing to the other options.	y feasible. The smethod consists of twes do nearly all the it will be mostly placement and es, the structure ound and sized to be mechanical bble chunks from y after deconation so ecylable. If of shear and ram r would be used, it all-mechanical uearly all on the molition. The time bout is of the first cliability is far tess of the	Mechanical Demolition This method is technically feasible and is a combination of the first two. That is, explosives would do the brute force structure demolition, followed by mechanical destruction of the resulting larger sectional pieces. This method utilizes drilling to place explosives, but the advantage over the second method is the reduced particulate emissions by a more sophisticated drilling system. The other large advantage of this method is the designed separation of concrete from rebar by the explosive layout and detonation timing. This gives tremendous advantage in that it brings the structure to the ground, and the resulting sectional elements are already separated from the rebar, without having to disintegrate the concrete into small chunks creating a considerable amount of dust, as in the separation of concrete into small chunks creating a considerable amount of dust, as in the separation of concrete will nearly all be disintegrate the concrete will meathy all be disectly recyclable. The advantage over the second method is significantly lower dust generation, and a controlled dropping of the celling. By first dropping the structure to the ground and then mechanically busting up the larger rebar-free sectional pieces with much more direct access than the first method, also allows for more absolute dust control via a hose stream than the second method. Overall, this method is the most efficient, is unherently safer, and has the best opportunity
efficient, safe and responsible	ŧ	0	tor dust control. +

¹⁰ Each area evaluated, has a narrative row followed by an evaluation of the criteria: + is a positive aspect, 0 is a neutral aspect, and - is a negative impact, indicating the ranking of hazards, impacts, or acceptability

Table 1. Demolition Evaluation¹¹

	Mechanical Demolition	Explosive Implosion	Harmonic Delamination and Mechanical Demolition
Economic	The cost for mechanically demolishing room 101 is \$118,000 to \$185,000. The average cost is \$151,500.	The cost for explosive demolition of room 101 is \$205,000.	The cost for harmonic delamination and mechanical demolition of room 101 is \$188,000.
Cost	+		0

11 Each area evaluated, has a narrative row followed by an evaluation of the criteria: + is a positive aspect, 0 is a neutral aspect, and - is a negative impact, indicating the ranking of hazards, impacts, or acceptability

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